

Measures of Central Tendency

1. Mean
2. Median
3. Mode

1. Mean

1.1 Arithmetic Mean

The Arithmetic Mean nothing but average. The arithmetic mean is the sum of all values in the data set divided by the total number of values in the data set.

$$\text{Arithmetic Mean} = \frac{\text{Sum of values in the data set}}{\text{No. of values in the data set}} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} = \frac{\sum_{i=1}^n x_i}{n}$$

Depending on whether the data being analyzed is a sample or the population, the notation used to represent mean changes. The sample mean is represented as \bar{x} and population mean as μ .

1.2 Weighted Mean

The weighted mean is used when some values in the data set contribute more than others.

We can calculate weighted mean by the total of multiplication of individual weights with values divided by total weight. This can be computed using the following formula:

$$\text{Weighted Mean} = \frac{wx_1 + wx_2 + wx_3 + \dots + wx_n}{w_1 + w_2 + w_3 + \dots + w_n} = \frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i}$$

1.3 Geometric Mean

The geometric mean is used while finding the average of numbers that represent growth rate. It is used in cases where a set of numbers need to be multiplied to get the required result.

$$\text{Geometric Mean} = \sqrt[n]{x_1 x_2 x_3 \dots x_n}$$

The geometric mean is used to represent a single value that is equivalent to all the values in the data set. Since the geometric mean is calculated by using a square root, so it can be used only for positive values.

1.4 Harmonic Mean

Harmonic mean is a better estimate of the average of data in situations where the data represents rates/ratios such as speed (km per hr.), heart rate (beats per min.), frequency etc.

The harmonic mean is the reciprocal of the arithmetic mean of the reciprocals.

$$\text{Harmonic Mean} = \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \dots + \frac{1}{x_n}}$$

2. Median

We cannot use mean when we have outlier in data. Median is the value that lies at the center of the data set when data is ordered. Median divides the data into equal halves when the data is sorted.

Finding the median:

- If there are an odd number of values, the median is the value at the center that divides the data into equal halves
- If there are even number of values, the median is the average of the two middle values

Arrange the observations in ascending order.

Number of observations (n) is **odd**.

The median is the middle value,
which is at position

$$\left(\frac{n+1}{2} \right)$$

Number of observations (n) is **even**.

The median is the average of the two
middle values.

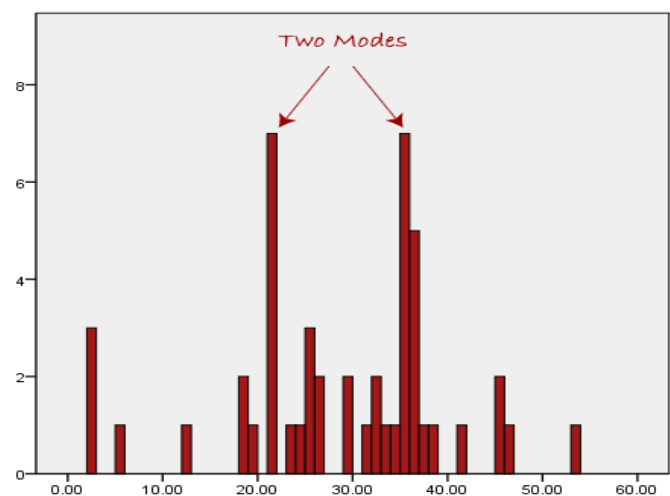
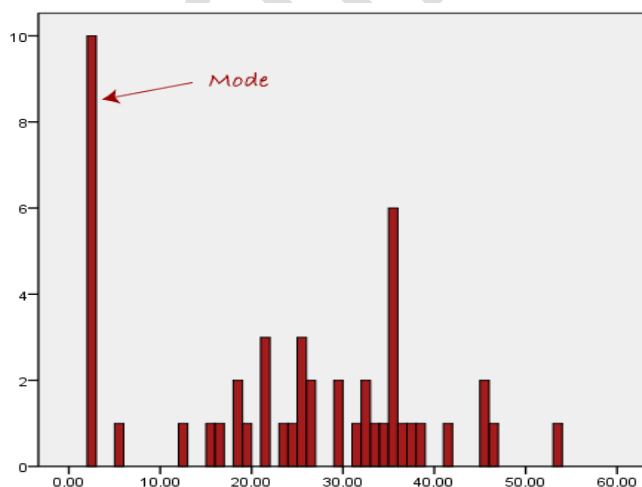
1. Find the value at position $\left(\frac{n}{2} \right)$

2. Find the value at position $\left(\frac{n}{2} \right) + 1$

3. Find the average of the two values to get
the median.

3.Mode

The mode is the most frequently occurring value in the data set. It's possible to have no mode, one mode, or more than one mode.



Relationship between Mean, Median and Mode

